An Empirical Research Regarding Information Technology in Hospitality Industry: A Case Study from Mures County

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Tourism has a basic role within economy but also within a country and within the human social assembly. In the course of time, tourism services have become the key component of tourism activity, therefore a detailed attention has been provided to the units supplying tourism services, but especially to hotels and factors that can influence competitiveness of these units.

One of the characteristic elements that contribute to getting the competitive advantage is represented by information technologies. Therefore, this paper has as general scope, presentation of the main factors that define information technology in hotels in Mures County and distribution of hotels according with implementation of information technology. On this line, I have used enquiry as the research method, and questionnaire as a working tool, this being administered to all the hotel managers in Mures County.

The study results are highly important for theoreticians and practitioners as well, allowing the achievement of a frame related to the development way of information technologies in hotels.

Keywords: information technology; hospitality industry; Mures County; PCA; Cluster Analysis

Introduction

Continuous development of information technology has thorough implications for the entire tourism industry. Nowadays, information technology is used in many sectors within the tourism industry and for a series of activities, from internal organization up to external communication with various branches of industry (Dinu, 2006, p. 734).

One of the most important components of tourism is the hospitality industry whose development is overwhelming both internationally and nationally. Furthermore, specialists in the field provide a significant attention to the hospitality industry, and within it, especially to the hotel units (O' Fallon & Rutherfort, 2011; Walton, 2009; Vallen & Vallen, 2012; Neacșu et al., 2011; Fleșeriu, 2011). In the hospitality industry, information technologies have experienced the highest increase, therefore the use of modern technology as well as internet and related services will change significantly, or will even eliminate the role of intermediators (Cojocariu, 2010, p. 76). There is a significant body of literature that examined information technology systems adoption and implementation from various perspectives. With respect to hospitality industry, information technology adoption has been gaining an increasing attention (Daghfous and Barkhi, 2009, p. 588). Sahadev and Islam (2005) found that, though hotel size was not related to information technology adoption, highergrade hotels are more likely to adopt advanced information technology (Daghfous and Barkhi, 2009, p. 588).

Concerning these aspects, we want to mention the objective of this research that is focused on two directions:
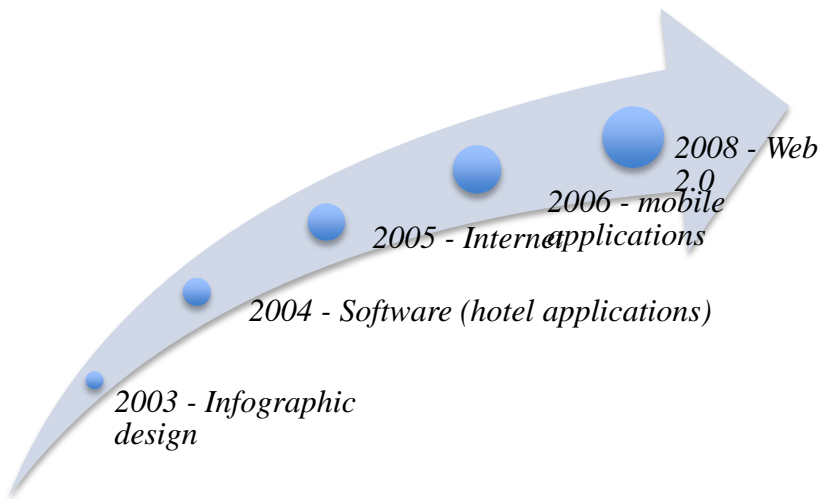
- Examination of grouping manner concerning hotels in Mures County according to the use of information technology in the business they carry out;
- Typological analysis of hotels in line with implementation of information technology.

Under the circumstances, we want to mention that this study is a part of a more extensive quantitative research that aims to improve the management of services in hotels in Mures County, where the following elements have been included: services supplied by hotel personnel, food services, entertaining services, additional services and customized services

and managerial practices through strategy in services, quality in services, human resources and information technology.

Literature Review

Regarding the current period, we notice that research and innovation investments, related with the continual development of information technology and communication have generated major changes in the structure of world economy. Technology has developed permanently in the course of time (figure 1), therefore internet, software and mobile technologies are increasingly focused on the customer (Aldebert et al., 2011, p. 9), and hotel managers should develop cooperation relations with important suppliers in the field of modern technologies, in order to cope with challenges and competition. As a matter of fact, technological resources that have been developed within the firm constitute the principal source of competitive advantage (Jacob and Groizard, 2007, p. 976).

2008 - Web 2.0

2006 - mobile applications

2005 - Internet

2004 - Software (hotel applications)

2003 - Infographic design

Figure 1: Development of modern technology over the years
(Source: Aldebert et al., 2011, p. 9)

At present, the main information technologies that serve hotel services are the following:

- Customer Relationship Management applications (CRM). Development of CRM applications requires a deep knowledge of customers' needs, behavior and preferences, and new technologies are one of the major drivers of change in this context (Minghetti, 2003, p. 141). For high-quality hotel units, the application of CRM is a great opportunity to in-crease customer value, enhance customer satisfaction and achieve business excellence and high profits (Wu&Lu, 2012, p. 276, according to Lin and Sun, 2003; Daghfous and Barkhi, 2009).

- Front-office information systems, booking information systems and hotel management in-formation systems. This category may comprise information systems type Fidelio (front-office information systems), Global Distribution Systems (GDS) - Worldspan, Amadeus, Galileo (booking information systems), Medallion Property Management System (Medalion PMS) and eXpresSoft (hotel management information systems).

There is a significant body of literature that examined information technology and information systems adoption and implementation and most of these studies, however, have focused on issues related to adoption and implementation of such technologies, which are often referred to as either information technology, implementation of cutting-edge information and communications technology or information systems to denote a combination of hardware, software and networking systems (Daghfous and Barkhi, 2009, p. 588) .

Thereby, finally we mention that the new information technologies (Global Distribution System, Internet, CRM, etc.) have generated real changes in the business of hotels, being the main factor that drives the increase of economic performances.

Formulation of hypotheses and description of research methodology

Regarding the research objectives, we would like to show the hypotheses of our research:

- o H1: There is a low number of factors that define the use of information technology in hotels;

o H2: A low number of hotels will group according to the software used in hotels.

In order to test the hypotheses, the statistical methods used are the Principal Component Analysis (PCA) and the Cluster Analysis. In the PCA, stages that should be covered when applying the method are the following (Sohrabi et al., 2012, p. 100 after Pitt&Jeantrout, 1994 and Costello&Osborne, 2005):

- "extraction" of initial components,
- component rotation,
- Selection of the number of factors.

Cluster analysis or typological analysis (Gabor, 2009, p. 127, after Smajda, 1988, pp.67-73), is a classification method that comprises:

- ranking techniques (upward or downward) that lead to a tree structure or a dendogram;
- partitioning techniques (with or without optimization) where, a classification criterium allow definition of exclusive mutual classes also making a partition;
- density techniques or research techniques of the way wherein groups search for regions containing a relatively dense concentration of points;
- Various techniques that is not classifiable in previous categories.

The methodological scope is to divide an assembly of elements in separate groups so as each element is similar with elements inside the group compared to those outside the group (Isaic-Maniu, 2003, p. 188). I have used the Euclidian distance in this study, based on the formula:

$$D_{ij} = \sqrt{\sum_{k=1}^{n} \left(x_{ki} - x_{kj} \right)^2}$$

where, Dij - is the distance between cases i and j, and xki - represents the value of xk variable for j case.

Also, the principal components resulted following the PCA application represented the base of applying the Cluster analysis, resulting – in line with characteristics of hotels within the study - main „clusters", types of hotels grouped on each principal components resulted, respectively. The

Cluster analysis shows the major advantage for fields such as business management or business administration, through the fact that is applicable to qualitative data, ordinary, this classifying respondent in line with their opinions in relation to a certain characteristic.

Data achieved were processed by means of software: SPSS 17.0 (Statistical Packages for the Social Sciences) and Microsoft Office Excel.

As regards surveyed population, it consists of 42 hotels, located in Mures County. Taking into consideration that the surveyed population is small sized, this study has been carried-out through total observation, data being taken over from the report entitled "List of tourism welcome structure with classified accommodation functions" presented by the Ministry of Regional Development and Tourism in Romania. The organization plan of statistical observation is the following:

Scope	• Gathering of data focused on information technology in hotels in Mures County
Collectivity	• Hotels in Mures County that comprise all classification categories
Unit	• Representative of hotel (administrator, manager, front-office manager, etc.)
Characteristics	• Enouncements related to information technology
Period	• September -October 2012
Place	• Establishments of hotels in Mures County
Organisational elements	• Face to face interview

Figure 2: Organization plan of statistical observation

Elements studied within this research pursue the dimension of implementing information technology in hotels by means of the following variables: We have a developed application type Customer Relationship Management, We use standard software (Word, Excel, data bases), We use front-office information systems type Fidelio, We use information systems dedicated to bookings (Worldspan, Amadeus, Galileo etc), We use management system type Medallion PMS, We use systems type eXpresSoft, We use services of some specialized sites that provide us online consultancy and advertising, and respondents (administrator, manager, front-office manager, etc.) were asked to describe the importance degree of variables, using a Likert scale for this, from 1 (not important) to 5 (very important).

Research results

In order to test the first hypothesis: There is a low number of factors that defines the use of information technology in hotels, I have used the PCA method, aiming to group the initial variables related to the use of information technology in hotels in Mures County, in new variables. By applying the PCA, the matrix of correlation coefficients for variables that are focused on implementing the information technology in hotels have indicated us that variable We use services of some specialized sites that provide us online consultancy and advertising have registered very low correlations (below 0.1) with the other variables, that led to its elimination. The second processing (table 1) reveals medium and strong correlations between remaining variables.

Table 1: Correlation Matrix

VARIABLES	We have a developed application type Customer Relationship Management	We use standard software (Word, Excel, data bases)	We use front-office information systems type Fidelio	We use information systems dedicated to bookings (Worldspan, Amadeus, Galileo	We use hotel management system type Medallion PMS	We use systems type *eXpresSoft*
We have a developed application type Customer Relationship Management	1.000	.236	**.421**	**.308**	-.117	**.338**
We use standard software (Word, Excel, data bases)		1.000	.037	-.162	.297	**.488**
We use front-office information systems type Fidelio			1.000	**.785**	-.124	**.367**
We use information systems dedicated to bookings (Worldspan, Amadeus, Galileo etc)				1.000	-.200	**.396**
We use hotel management system type Medallion PMS					1.000	.101
We use systems type *eXpresSoft*						1.000

The following table (table 2) shows that the six initial variables have grouped in two principal components that explain 67% of total variance. Thus, the first component explains approximately 40% of variance, and the second component explains approximately 27% of variance.

Table 2: Total variance explained by principal components

| Component	Initial eigenvalues			Extraction sums of squared loadings			Rotation sums od squared loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	2.398	39.958	39.958	2.398	39.958	39.958	2.383	**39.717**	39.717
2	1.596	26.592	66.551	1.596	26.592	66.551	1.610	**26.834**	66.551
3	.843	14.042	80.593						
4	.624	10.404	90.997						
5	.384	6.403	97.401						
6	.156	2.599	100.000						
Method: Principal Component Analysis									

Grouping of variables describing information technology within hotels is illustrated in table 3, the two principal components being made of the following initial variables:

- principal component 1 (PC1), comprised of variables: We use the hotel management system Medallion PMS, We use systems type eXpresSoft, We have developed an application type Customer Relationship Managementand, We use information systems dedicated to bookings (Worldspan, Amadeus, Galileo etc.), which we shall name it hotel management professional software;
- Principal component 2 (PC2), comprised of variables: We use front-office information systems type Fidelio and we use common software (Word, Excel, databases), which we shall name it standard hotel management software applications.

**Table 3:** Rotated Component Matrix

Variables	Component	
	1	2
We use hotel management system type Medallion PMS	.881	
We use systems type *eXpresSoft*	.860	
We have a developed application type Customer Relationship Management	.639	
We use information systems dedicated to bookings (Worldspan, Amadeus and Galileo etc.)	.623	
We use front-office information systems type Fidelio		.876
We use standard software (Word, Excel, data bases)		.635
Method: Principal Component Analysis *Rotation method: Varimax with Kaiser* *Nominalization*		

The two components reveal us a discriminatory group between these variables, thus the study comprises hotels that either use professional hotel management software applications, or use standard software applications (figure 3) in managing accommodation and food and beverage services.
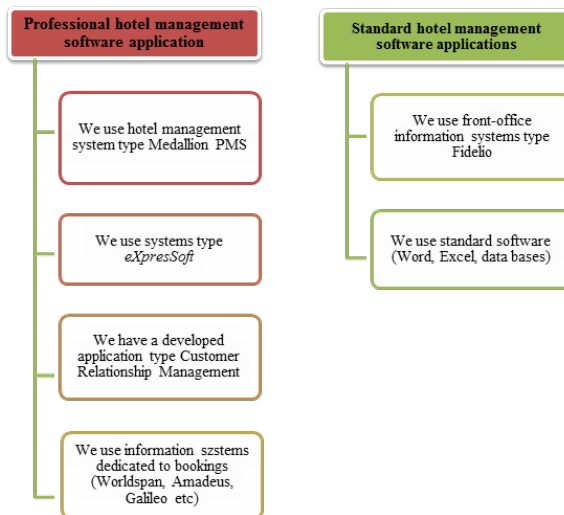
Figure 3: Factors describing information technology by applying the PCA

In order to study thoroughly the results of previous analysis, we have applied the cluster analysis starting from the second statistical hypothesis: A low number of hotels will group according to software used by hotels. In order to visualize which hotel categories are grouped on these components, we further apply the hierarchical cluster analysis, through which we set a final number of three clusters according to the following figure (figure 4):
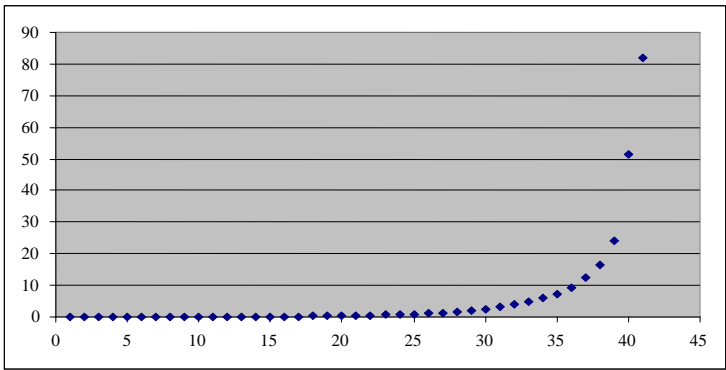

Figure 4: Graphical representation of final clusters

Analyzing the results of the cluster analysis for principal components (table 4), the following aspects result:

- Cluster 1 consists of 9 hotels classified as 3 star, 4 star and 5 star category (figure 4), being defined by PC1 – professional hotel management software applications and different by PC2 – common hotel management software applications;
- Cluster 2 consists of 33 hotels classified as 1 star, 2 star, 3 star and 4 star category (figure 4), being defined by PC2 – standard hotel management software applications and different by PC1 – professional hotel management software applications;

Table 4: Results of Cluster analysis for principal components

Principal components	Final clusters		ANOVA					
	Cluster 1	Cluster 2	Cluster		Error		F-test	Statistical significance
			Mean square	Degrees of freedom	Mean square	Degrees of freedom		
PC 1	1.59892	-.43607	29.284	1	.293	40	99.979	.000
PC 2	-.44053	.12014	2.223	1	.969	40	2.293	.138
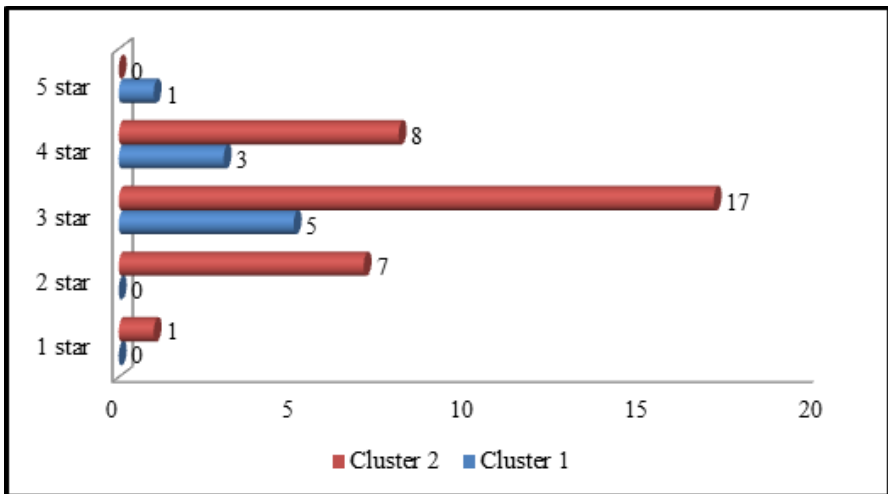
Figure 5: Distribution of hotels according to classification category of hotel and cluster it belongs to

In conclusion, the two hypotheses worded for statements related to information technology implemented in hotels in Mureș County, have been acknowledged fully, resulting a low number of factors, two principal components, respectively (professional hotel management software applications and standard hotel management software applications), and following the cluster analysis, a group of only 9 hotels with 3, 4 and 5 stars have been identified and that use professional software applications.

Conclusions

Starting from the research hypotheses, we may conclude that there are a low number of elements that are focused on using IT in hotels in Mureş County, respectively:

- o Professional hotel management software applications, used by 9 hotels with 3,4 and 5 stars, and
- o Standard hotel management software applications, used by 33 hotels with 1, 2, 3 and 4 stars.

According to the results achieved, a low number of hotels in Mures County use professional IT systems in carrying-out their activity, therefore we consider important to suggest the managers working in this business to improve activity by implementing some new information technology that is in line with the current consumption requirements of tourists. These results are validated by previous international studies (Sahadev and Islam, 2005) that emphasized the fact that hotels having a higher category implement professional systems in carrying-out their activity. The role of information technologies is also acknowledged in the activity of hotels through research carried-out in the field that emphasized the existence of a strong relation between implementation of information technology and performance (Kim et al., 2008; Wu et al., 2012; Abu Kasim & Badriyah Minai, 2009).

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